FIG. 1 PRIOR ART

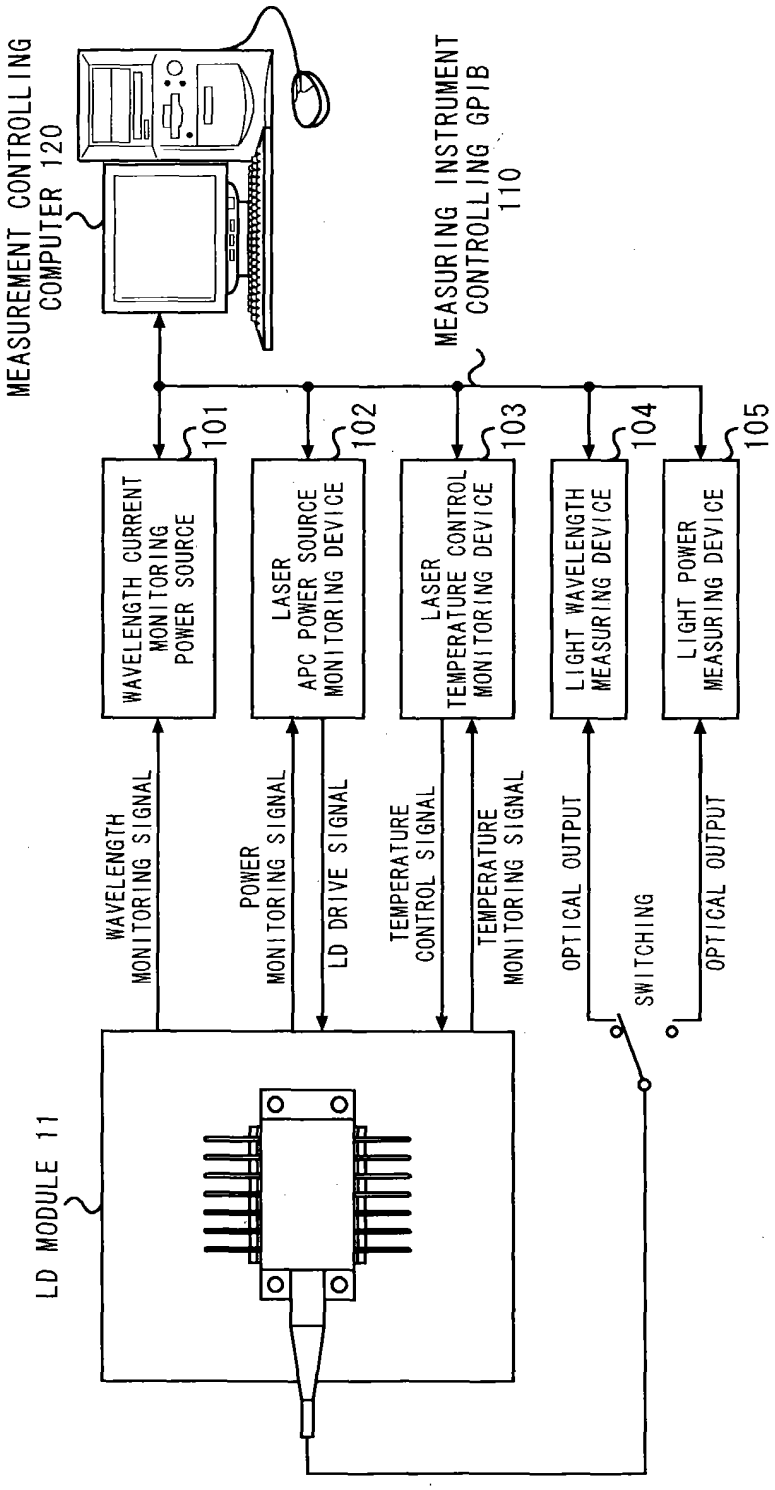


FIG. 2 PRIOR ART

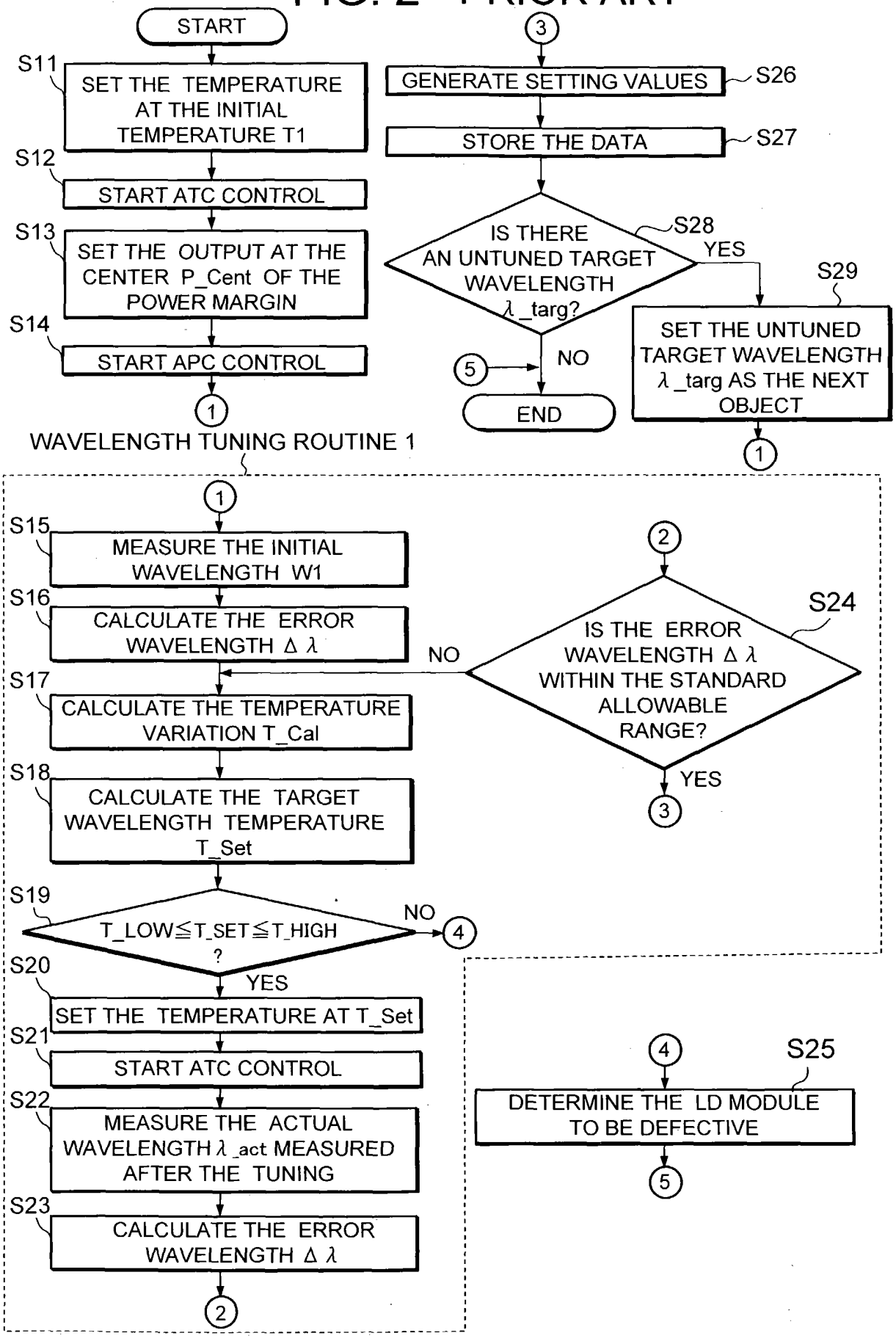


FIG. 3A PRIOR ART

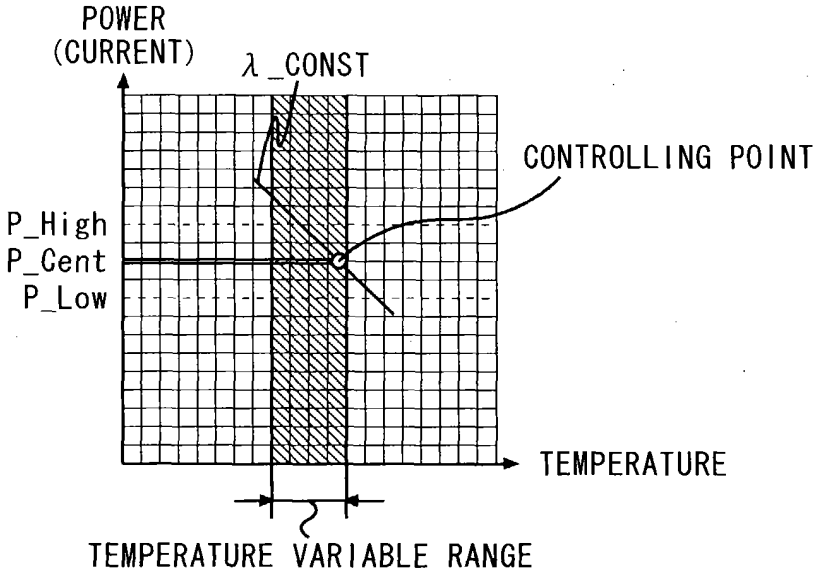


FIG. 3B PRIOR ART

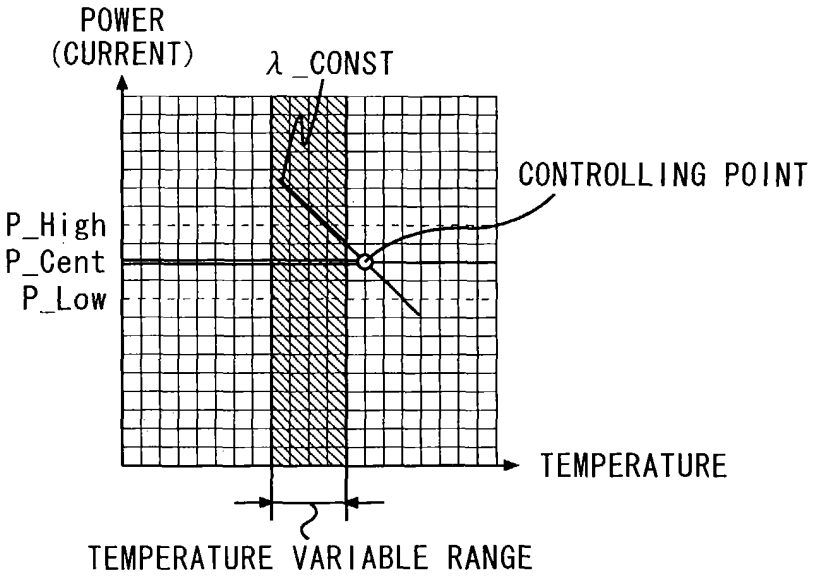


FIG. 4A

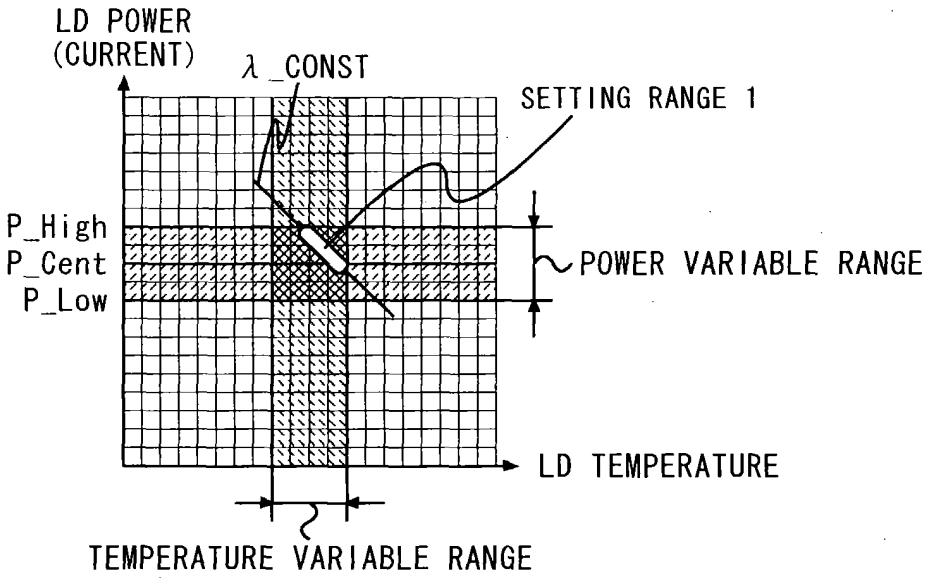

LD POWER
(CURRENT)
λ_CONST
SETTING RANGE 1
P_High
P_Cent
P_Low
POWER VARIABLE RANGE
LD TEMPERATURE
TEMPERATURE VARIABLE RANGE

FIG. 4B

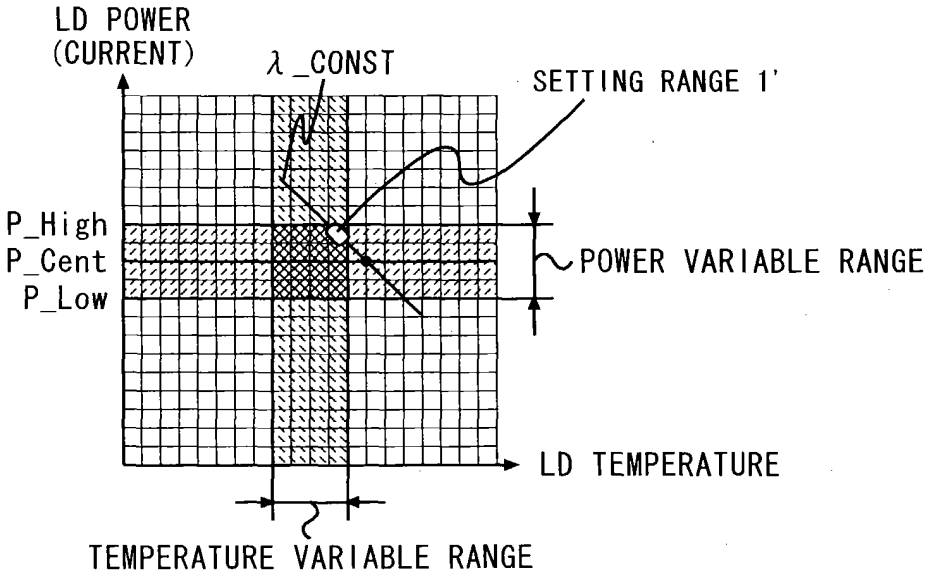

LD POWER
(CURRENT)
λ_CONST
SETTING RANGE 1'
P_High
P_Cent
P_Low
POWER VARIABLE RANGE
LD TEMPERATURE
TEMPERATURE VARIABLE RANGE

FIG. 5

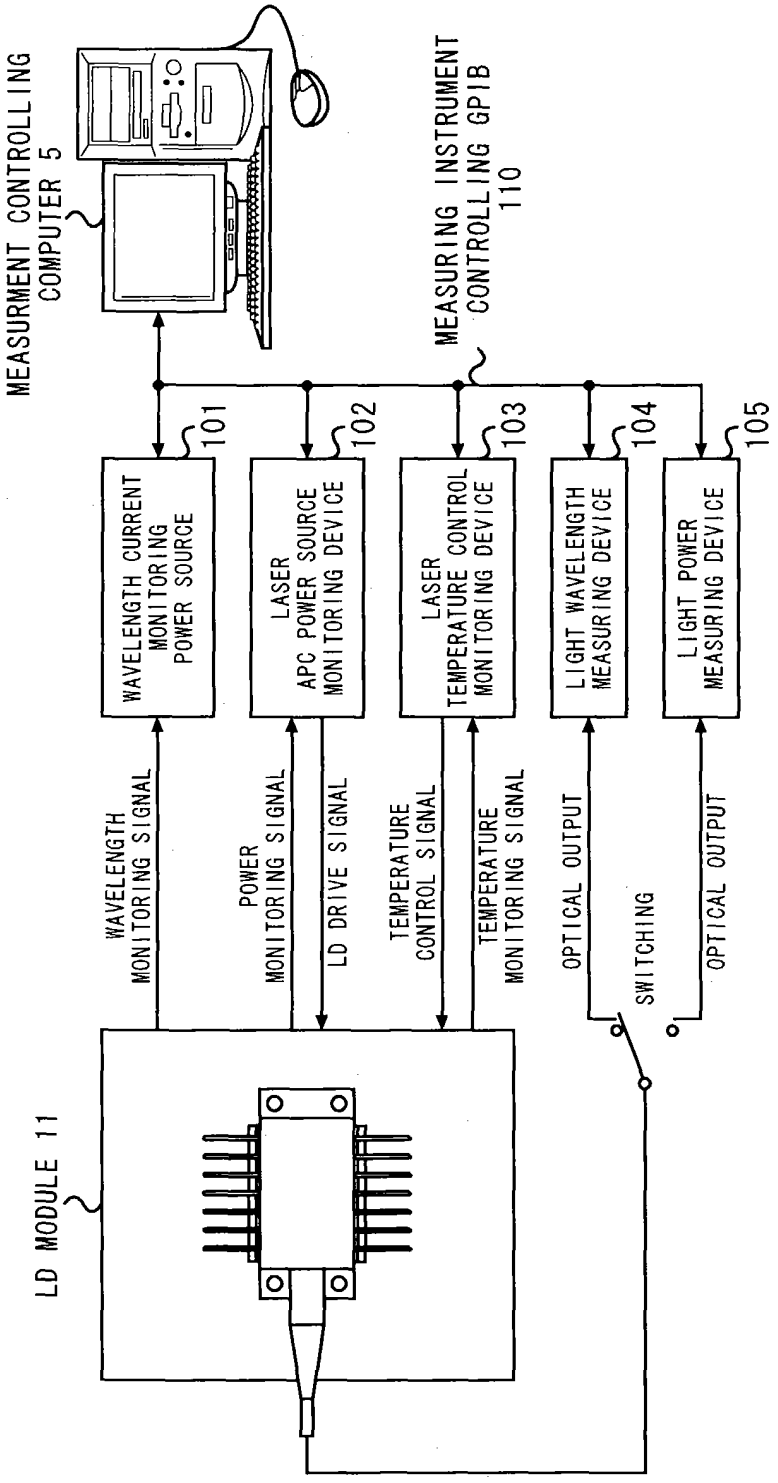

MEASURMENT CONTROLLING COMPUTER 5
MEASURING INSTRUMENT CONTROLLING GPIB 110
WAVELENGTH CURRENT MONITORING POWER SOURCE
101
LASER APC POWER SOURCE MONITORING DEVICE
102
LASER TEMPERATURE CONTROL MONITORING DEVICE
103
LIGHT WAVELENGTH MEASURING DEVICE
104
LIGHT POWER MEASURING DEVICE
105
WAVELENGTH MONITORING SIGNAL
POWER MONITORING SIGNAL
LD DRIVE SIGNAL
TEMPERATURE CONTROL SIGNAL
TEMPERATURE MONITORING SIGNAL
OPTICAL OUTPUT
SWITCHING
OPTICAL OUTPUT
LD MODULE 11

FIG.6

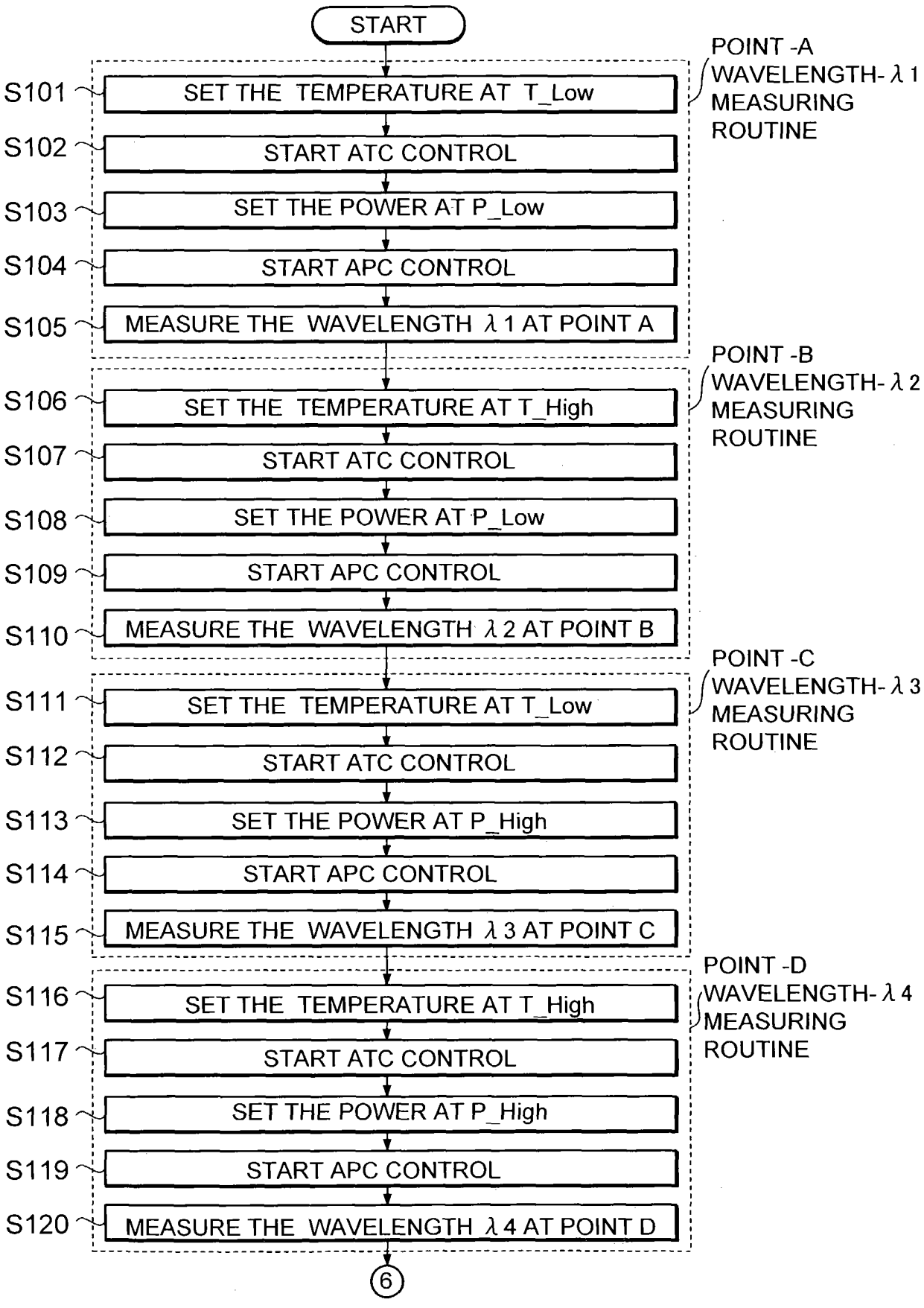

START
POINT -A WAVELENGTH- λ 1 MEASURING ROUTINE
S101
SET THE TEMPERATURE AT T_Low
S102
START ATC CONTROL
S103
SET THE POWER AT P_Low
S104
START APC CONTROL
S105
MEASURE THE WAVELENGTH λ 1 AT POINT A
POINT -B WAVELENGTH- λ 2 MEASURING ROUTINE
S106
SET THE TEMPERATURE AT T_High
S107
START ATC CONTROL
S108
SET THE POWER AT P_Low
S109
START APC CONTROL
S110
MEASURE THE WAVELENGTH λ 2 AT POINT B
POINT -C WAVELENGTH- λ 3 MEASURING ROUTINE
S111
SET THE TEMPERATURE AT T_Low
S112
START ATC CONTROL
S113
SET THE POWER AT P_High
S114
START APC CONTROL
S115
MEASURE THE WAVELENGTH λ 3 AT POINT C
POINT -D WAVELENGTH- λ 4 MEASURING ROUTINE
S116
SET THE TEMPERATURE AT T_High
S117
START ATC CONTROL
S118
SET THE POWER AT P_High
S119
START APC CONTROL
S120
MEASURE THE WAVELENGTH λ 4 AT POINT D
6

FIG.7

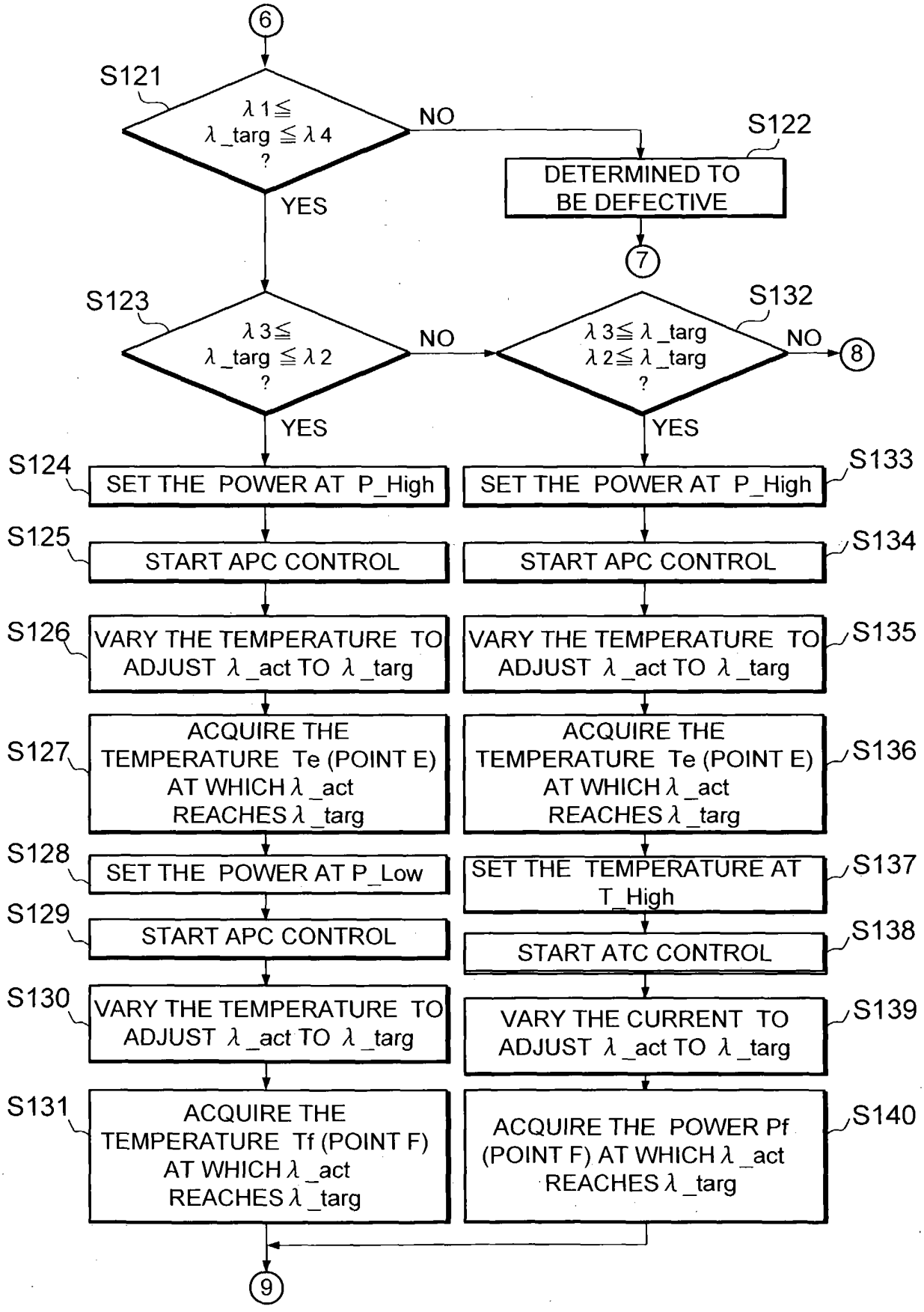

6
S121
λ1≦ λ_targ ≦λ4 ?
NO
S122
DETERMINED TO BE DEFECTIVE
YES
7
S123
λ3≦ λ_targ ≦λ2 ?
NO
S132
λ3≦λ_targ λ2≦λ_targ ?
NO
8
YES
YES
S124
SET THE POWER AT P_High
S133
SET THE POWER AT P_High
S125
START APC CONTROL
S134
START APC CONTROL
S126
VARY THE TEMPERATURE TO ADJUST λ_act TO λ_targ
S135
VARY THE TEMPERATURE TO ADJUST λ_act TO λ_targ
S127
ACQUIRE THE TEMPERATURE Te (POINT E) AT WHICH λ_act REACHES λ_targ
S136
ACQUIRE THE TEMPERATURE Te (POINT E) AT WHICH λ_act REACHES λ_targ
S128
SET THE POWER AT P_Low
S137
SET THE TEMPERATURE AT T_High
S129
START APC CONTROL
S138
START ATC CONTROL
S130
VARY THE TEMPERATURE TO ADJUST λ_act TO λ_targ
S139
VARY THE CURRENT TO ADJUST λ_act TO λ_targ
S131
ACQUIRE THE TEMPERATURE Tf (POINT F) AT WHICH λ_act REACHES λ_targ
S140
ACQUIRE THE POWER Pf (POINT F) AT WHICH λ_act REACHES λ_targ
9

FIG.8

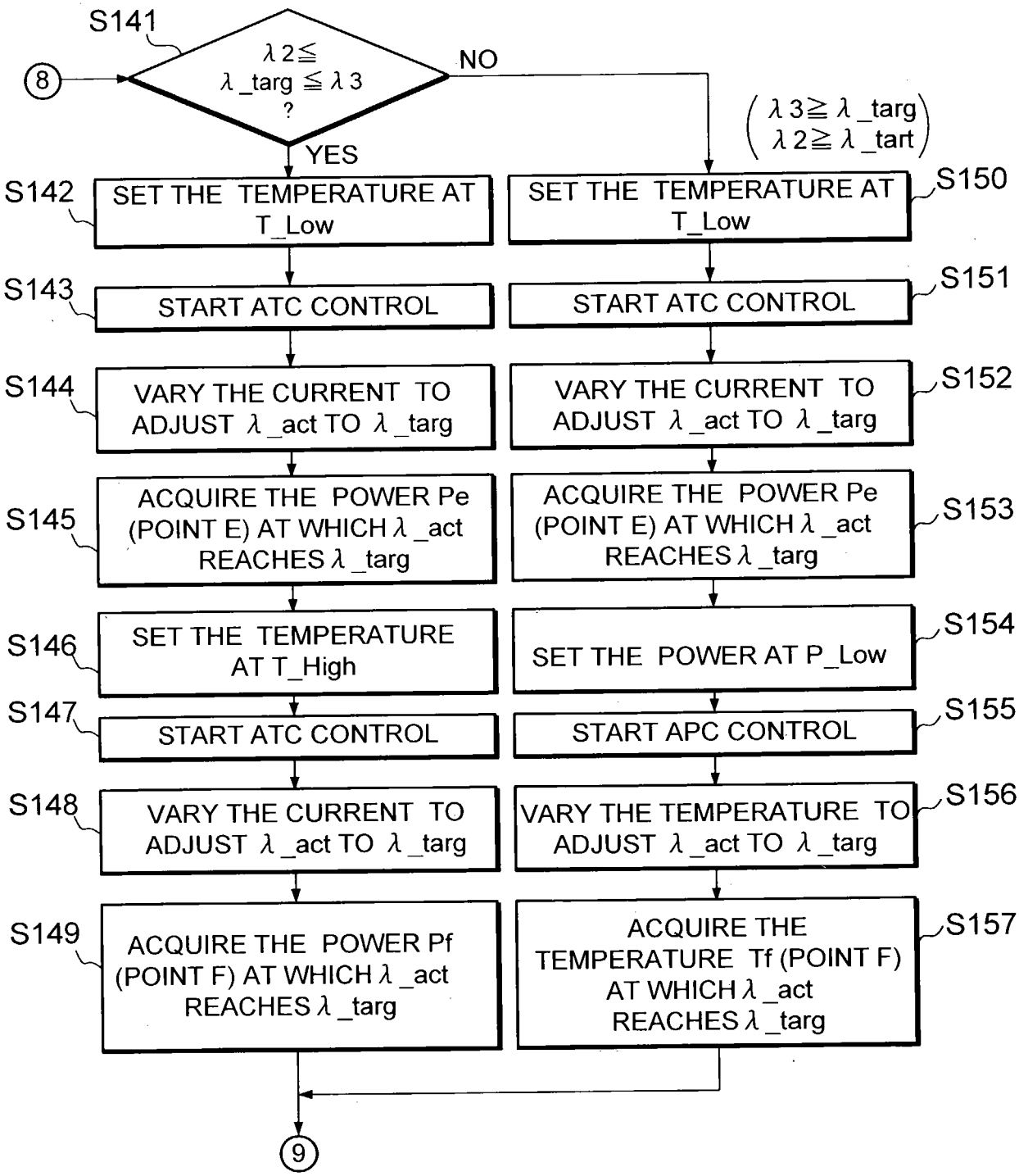

S141
λ2≦ λ_targ ≦λ3 ?
NO
YES
(λ3≧λ_targ λ2≧λ_tart)
8
S142
SET THE TEMPERATURE AT T_Low
S143
START ATC CONTROL
S144
VARY THE CURRENT TO ADJUST λ_act TO λ_targ
S145
ACQUIRE THE POWER Pe (POINT E) AT WHICH λ_act REACHES λ_targ
S146
SET THE TEMPERATURE AT T_High
S147
START ATC CONTROL
S148
VARY THE CURRENT TO ADJUST λ_act TO λ_targ
S149
ACQUIRE THE POWER Pf (POINT F) AT WHICH λ_act REACHES λ_targ
S150
SET THE TEMPERATURE AT T_Low
S151
START ATC CONTROL
S152
VARY THE CURRENT TO ADJUST λ_act TO λ_targ
S153
ACQUIRE THE POWER Pe (POINT E) AT WHICH λ_act REACHES λ_targ
S154
SET THE POWER AT P_Low
S155
START APC CONTROL
S156
VARY THE TEMPERATURE TO ADJUST λ_act TO λ_targ
S157
ACQUIRE THE TEMPERATURE Tf (POINT F) AT WHICH λ_act REACHES λ_targ
9

FIG.9

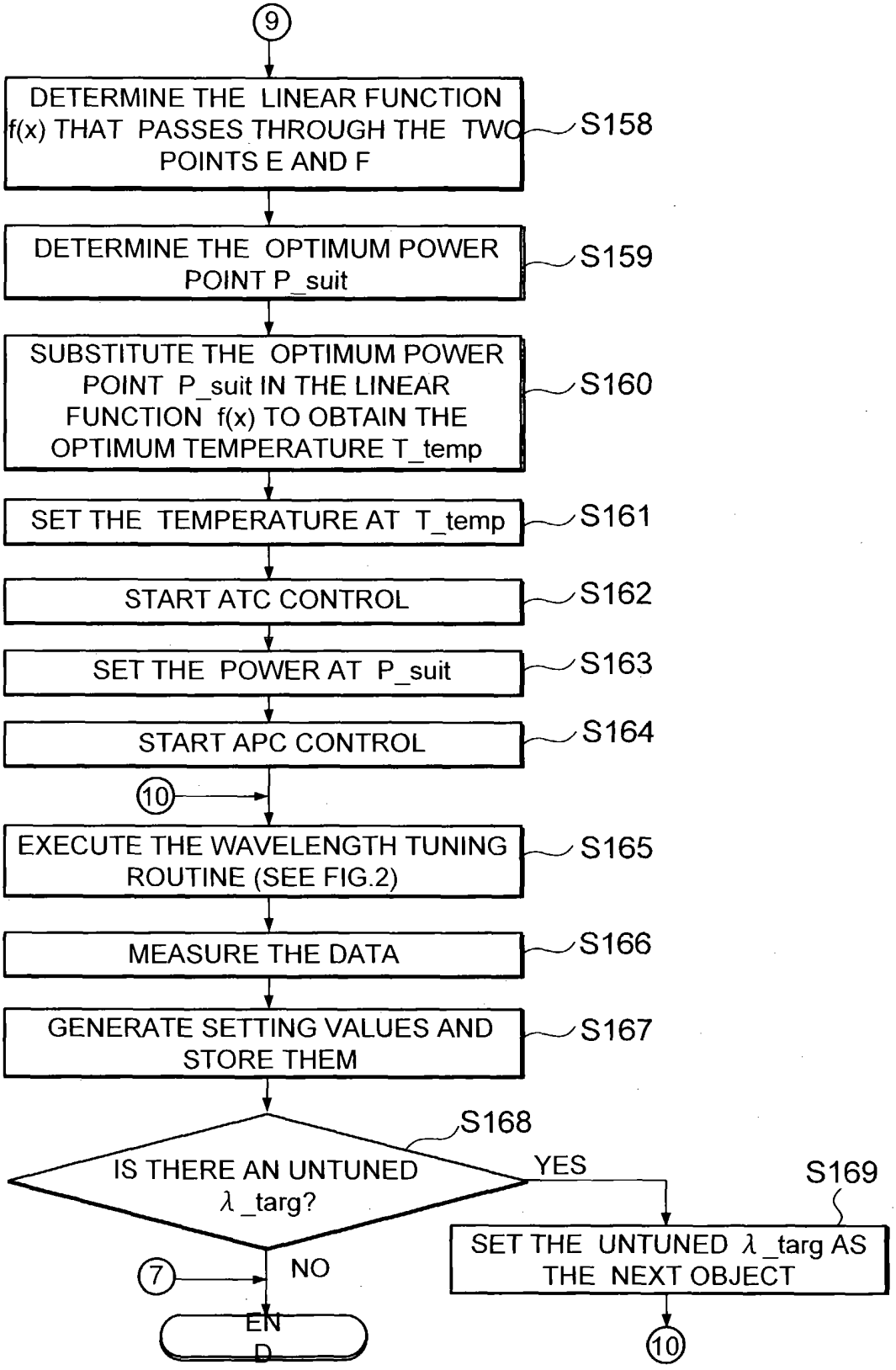

9
DETERMINE THE LINEAR FUNCTION f(x) THAT PASSES THROUGH THE TWO POINTS E AND F
S158
DETERMINE THE OPTIMUM POWER POINT P_suit
S159
SUBSTITUTE THE OPTIMUM POWER POINT P_suit IN THE LINEAR FUNCTION f(x) TO OBTAIN THE OPTIMUM TEMPERATURE T_temp
S160
SET THE TEMPERATURE AT T_temp
S161
START ATC CONTROL
S162
SET THE POWER AT P_suit
S163
START APC CONTROL
S164
10
EXECUTE THE WAVELENGTH TUNING ROUTINE (SEE FIG.2)
S165
MEASURE THE DATA
S166
GENERATE SETTING VALUES AND STORE THEM
S167
IS THERE AN UNTUNED λ_targ?
S168
YES
S169
SET THE UNTUNED λ_targ AS THE NEXT OBJECT
10
NO
7
END

FIG. 10A

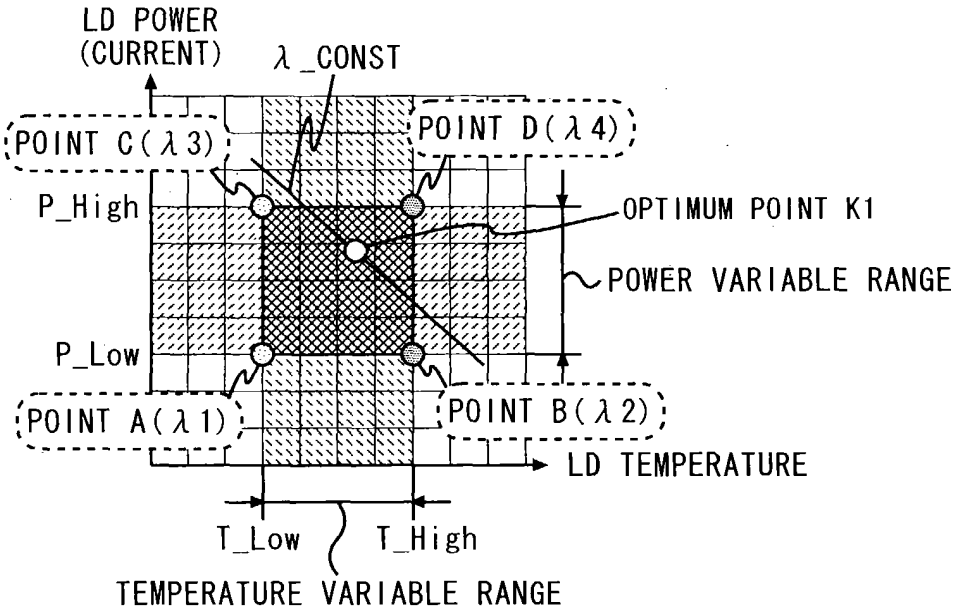
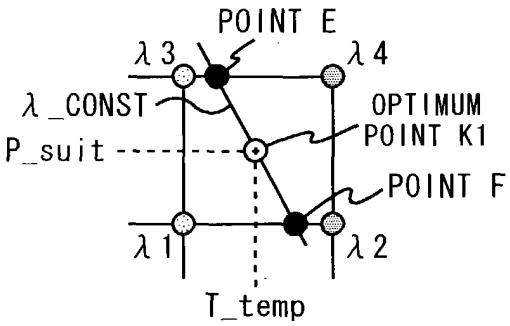
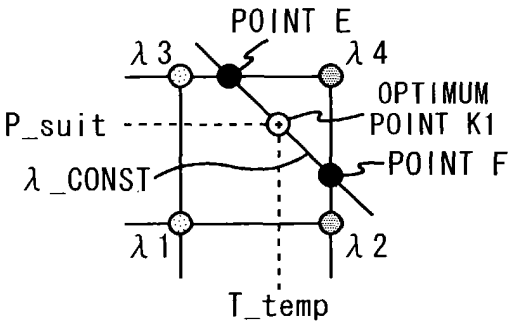

LD POWER
(CURRENT)
λ_CONST
POINT C(λ3)
POINT D(λ4)
P_High
OPTIMUM POINT K1
POWER VARIABLE RANGE
P_Low
POINT A(λ1)
POINT B(λ2)
LD TEMPERATURE
T_Low
T_High
TEMPERATURE VARIABLE RANGE

FIG. 10B



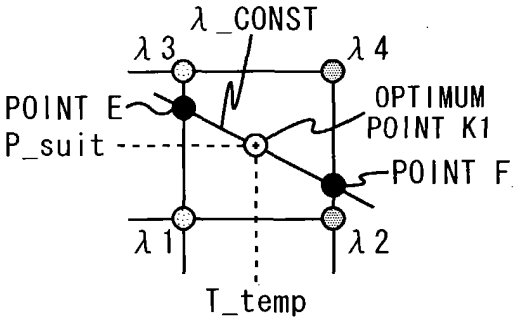
E/F POINTS MEASURING CONDITIONS
POINT E:POWER UPPER LIMIT(P_High)
POINT F:POWER LOWER LIMIT(P_Low)

FIG. 10C



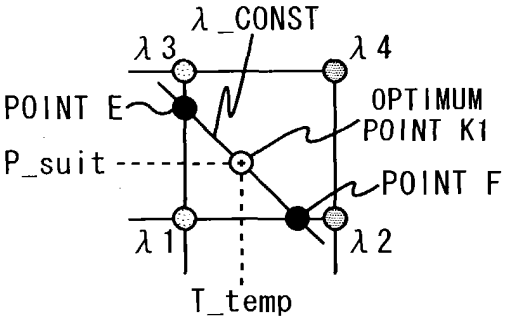
E/F POINTS MEASURING CONDITIONS
POWER E:POWER UPPER LIMIT(P_High)
POWER F:TEMPERATURE UPPER LIMIT(T_High)

FIG. 10D



E/F POINTS MEASURING CONDITIONS
POINT E:TEMPERATURE LOWER LIMIT(T_Low)
POINT F:TEMPERATURE UPPER LIMIT(T_High)

FIG. 10E



E/F POINTS MEASURING CONDITIONS
POINT E:TEMPERATURE LOWER LIMIT(T_Low)
POINT F:POWER LOWER LIMIT(P_Low)

FIG. 11

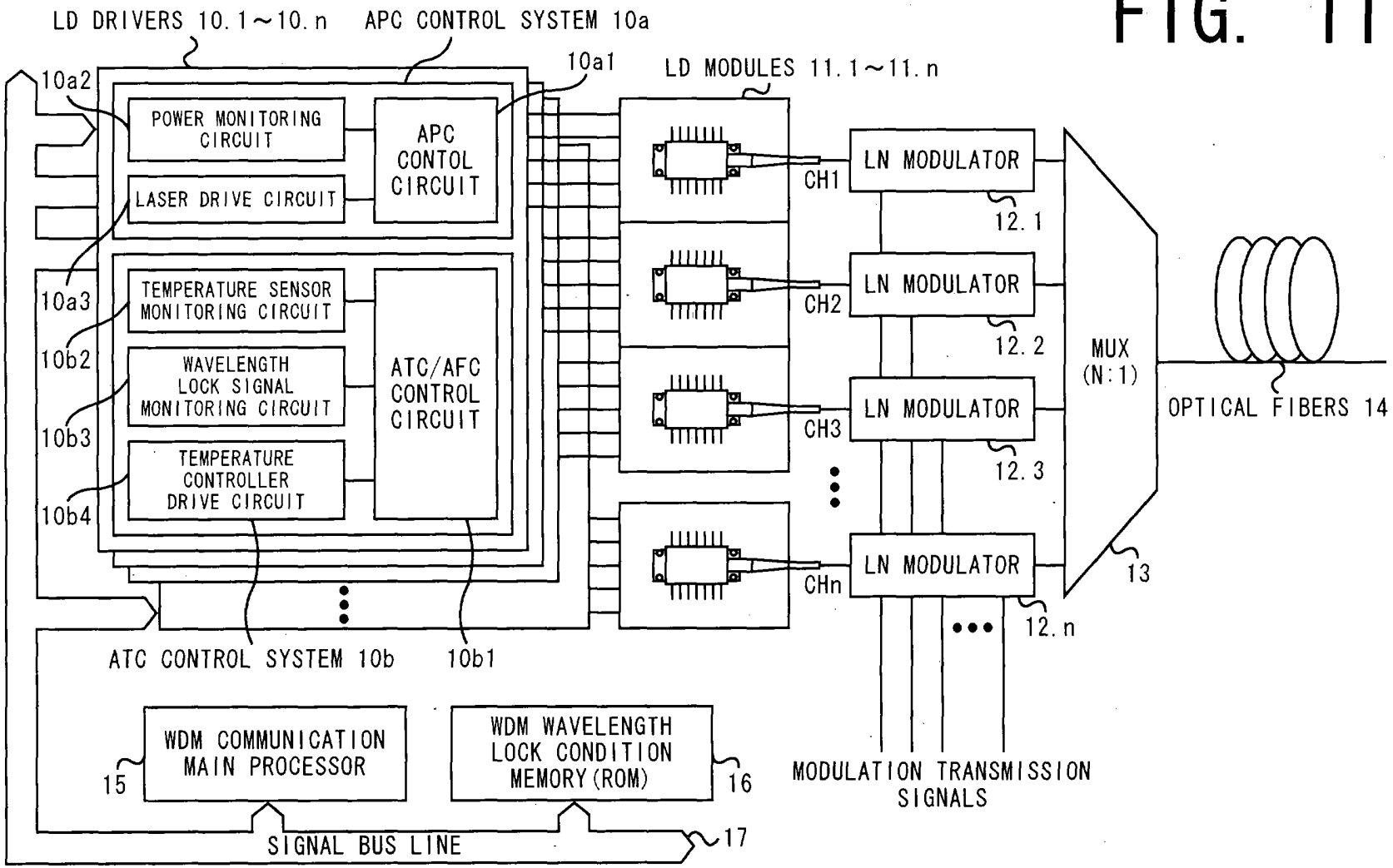

LD DRIVERS 10.1～10.n
APC CONTROL SYSTEM 10a
10a1
10a2
LD MODULES 11.1～11.n
POWER MONITORING CIRCUIT
LASER DRIVE CIRCUIT
APC CONTOL CIRCUIT
10a3
TEMPERATURE SENSOR MONITORING CIRCUIT
10b2
WAVELENGTH LOCK SIGNAL MONITORING CIRCUIT
10b3
TEMPERATURE CONTROLLER DRIVE CIRCUIT
10b4
ATC/AFC CONTROL CIRCUIT
CH1
CH2
CH3
CHn
LN MODULATOR
12.1
12.2
12.3
12.n
MUX (N:1)
13
OPTICAL FIBERS 14
ATC CONTROL SYSTEM 10b
10b1
WDM COMMUNICATION MAIN PROCESSOR
15
WDM WAVELENGTH LOCK CONDITION MEMORY (ROM)
16
SIGNAL BUS LINE
17
MODULATION TRANSMISSION SIGNALS

FIG. 12A PRIOR ART

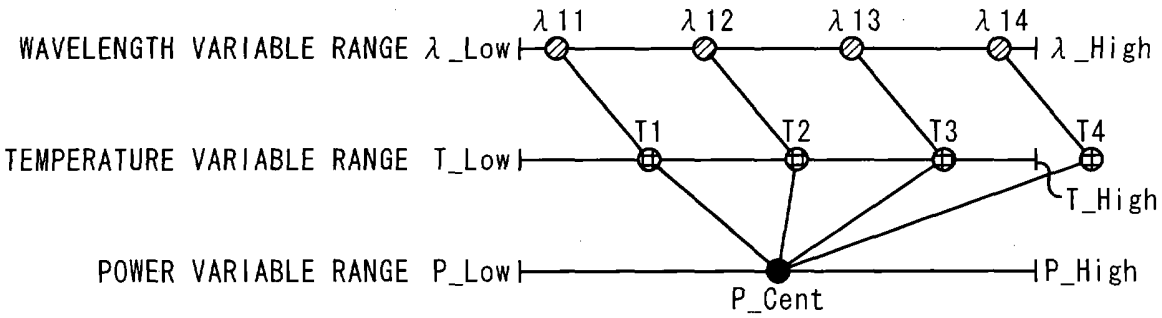


FIG. 12B

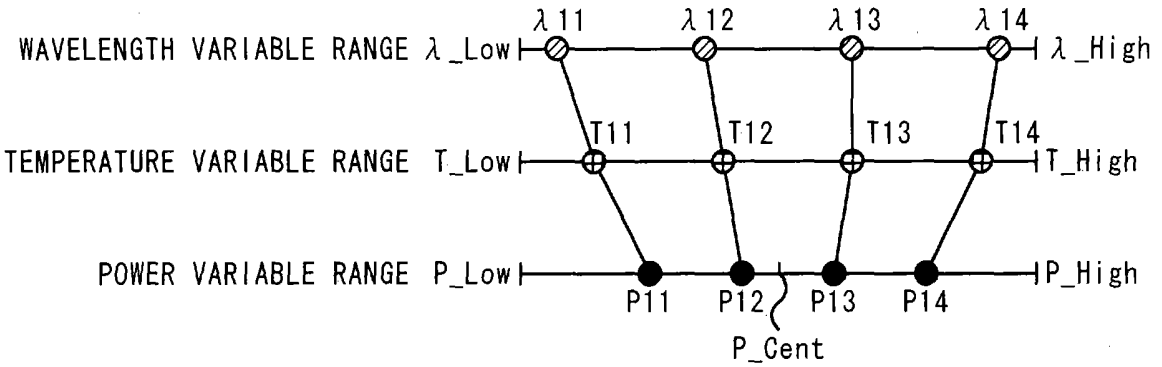


FIG. 13

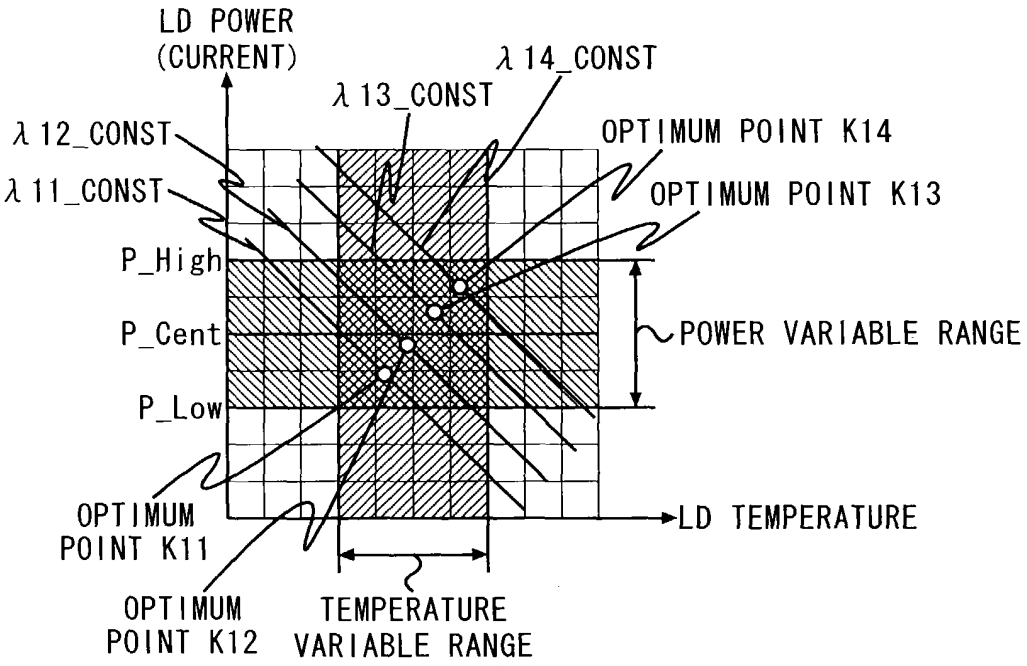

LD POWER
(CURRENT)
λ14_CONST
λ13_CONST
λ12_CONST
λ11_CONST
OPTIMUM POINT K14
OPTIMUM POINT K13
P_High
P_Cent
P_Low
POWER VARIABLE RANGE
OPTIMUM
POINT K11
LD TEMPERATURE
OPTIMUM
POINT K12
TEMPERATURE
VARIABLE RANGE

FIG.14

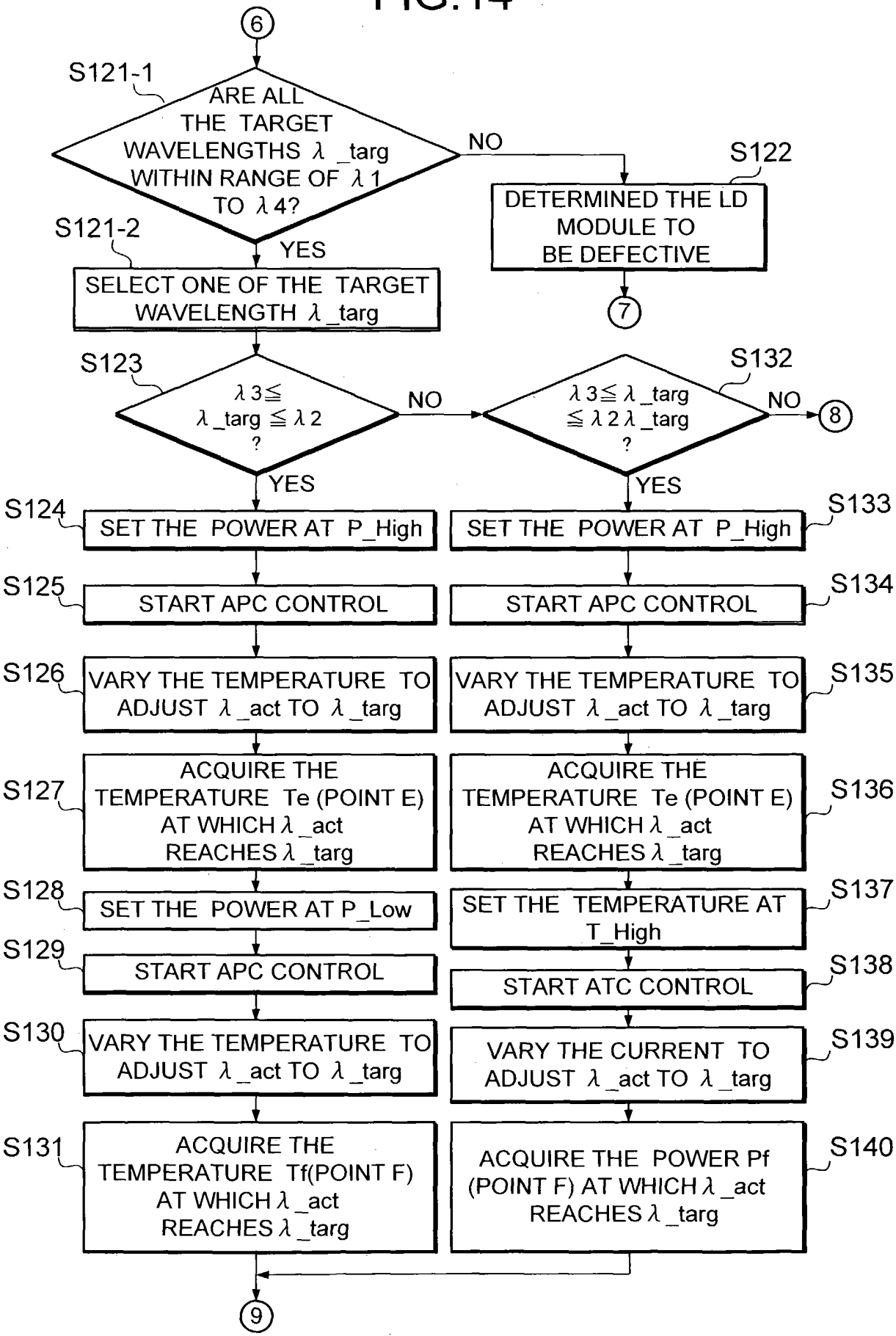

6
S121-1
ARE ALL THE TARGET WAVELENGTHS λ_targ WITHIN RANGE OF λ1 TO λ4?
NO
S122
DETERMINED THE LD MODULE TO BE DEFECTIVE
7
YES
S121-2
SELECT ONE OF THE TARGET WAVELENGTH λ_targ
S123
λ3≦ λ_targ ≦λ2 ?
NO
S132
λ3≦λ_targ ≦λ2λ_targ ?
NO
8
YES
YES
S124
SET THE POWER AT P_High
S133
SET THE POWER AT P_High
S125
START APC CONTROL
S134
START APC CONTROL
S126
VARY THE TEMPERATURE TO ADJUST λ_act TO λ_targ
S135
VARY THE TEMPERATURE TO ADJUST λ_act TO λ_targ
S127
ACQUIRE THE TEMPERATURE Te (POINT E) AT WHICH λ_act REACHES λ_targ
S136
ACQUIRE THE TEMPERATURE Te (POINT E) AT WHICH λ_act REACHES λ_targ
S128
SET THE POWER AT P_Low
S137
SET THE TEMPERATURE AT T_High
S129
START APC CONTROL
S138
START ATC CONTROL
S130
VARY THE TEMPERATURE TO ADJUST λ_act TO λ_targ
S139
VARY THE CURRENT TO ADJUST λ_act TO λ_targ
S131
ACQUIRE THE TEMPERATURE Tf(POINT F) AT WHICH λ_act REACHES λ_targ
S140
ACQUIRE THE POWER Pf (POINT F) AT WHICH λ_act REACHES λ_targ
9

FIG.15

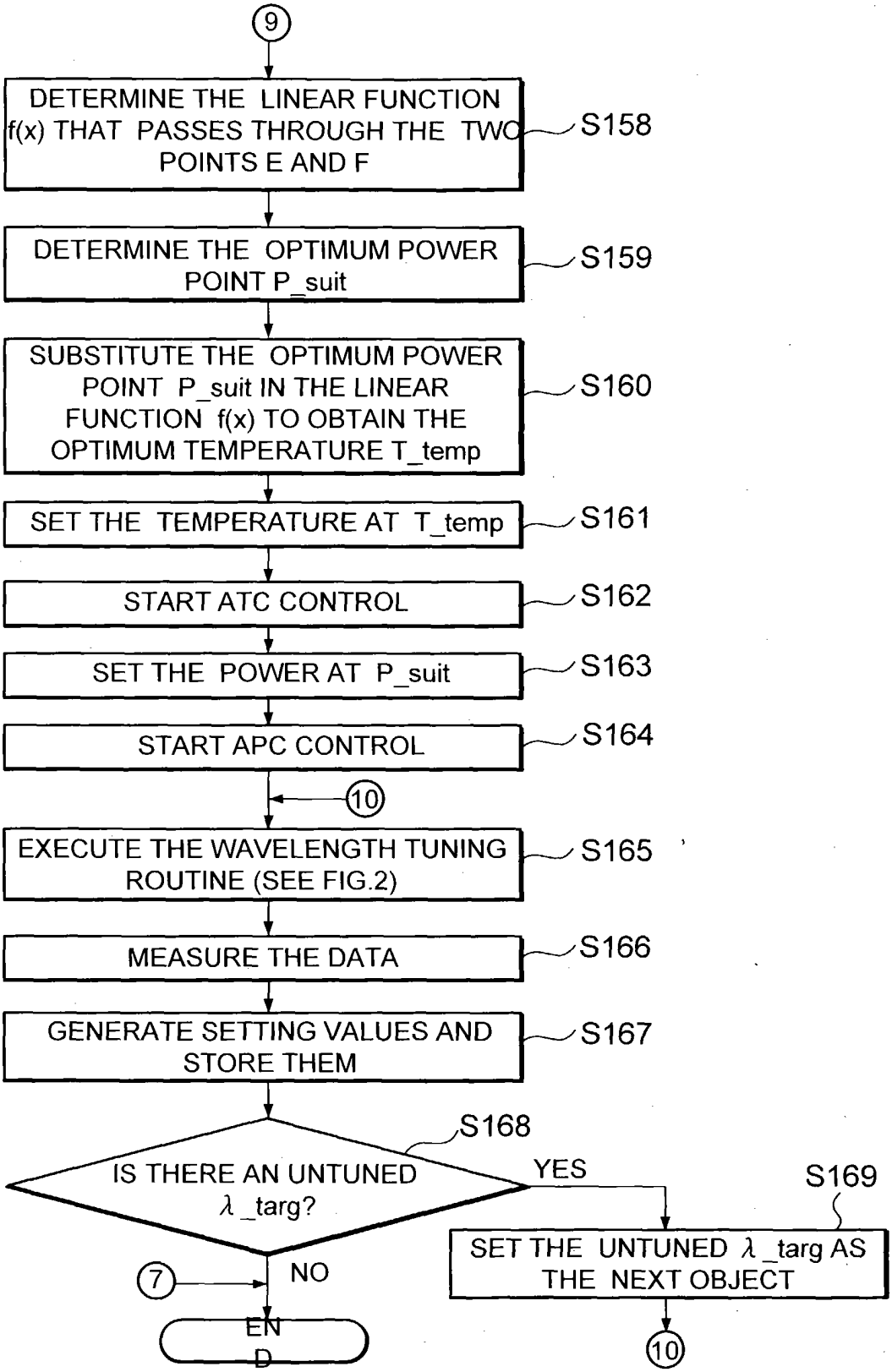

9
DETERMINE THE LINEAR FUNCTION f(x) THAT PASSES THROUGH THE TWO POINTS E AND F
S158
DETERMINE THE OPTIMUM POWER POINT P_suit
S159
SUBSTITUTE THE OPTIMUM POWER POINT P_suit IN THE LINEAR FUNCTION f(x) TO OBTAIN THE OPTIMUM TEMPERATURE T_temp
S160
SET THE TEMPERATURE AT T_temp
S161
START ATC CONTROL
S162
SET THE POWER AT P_suit
S163
START APC CONTROL
S164
10
EXECUTE THE WAVELENGTH TUNING ROUTINE (SEE FIG.2)
S165
MEASURE THE DATA
S166
GENERATE SETTING VALUES AND STORE THEM
S167
S168
IS THERE AN UNTUNED λ_targ?
YES
S169
SET THE UNTUNED λ_targ AS THE NEXT OBJECT
10
NO
7
END

FIG. 16

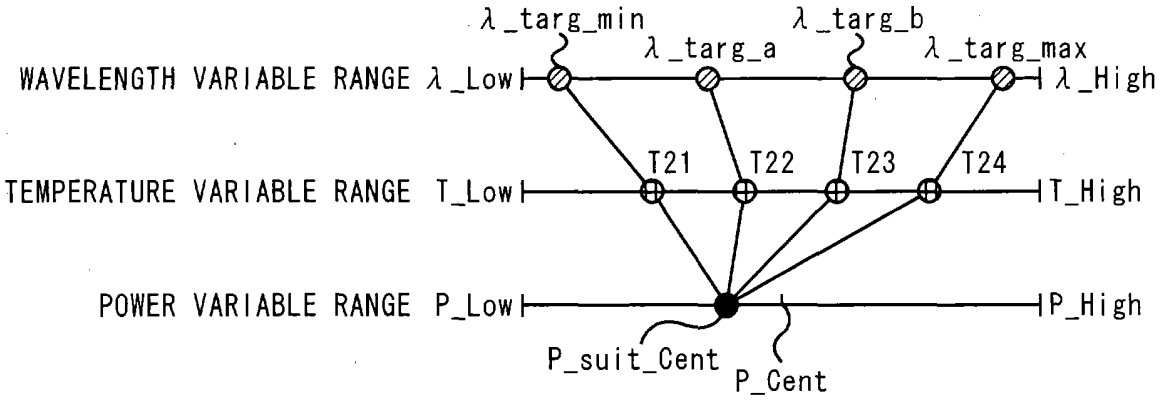

λ_targ_min
λ_targ_a
λ_targ_b
λ_targ_max
WAVELENGTH VARIABLE RANGE λ_Low
λ_High
T21
T22
T23
T24
TEMPERATURE VARIABLE RANGE T_Low
T_High
POWER VARIABLE RANGE P_Low
P_High
P_suit_Cent
P_Cent

FIG. 17

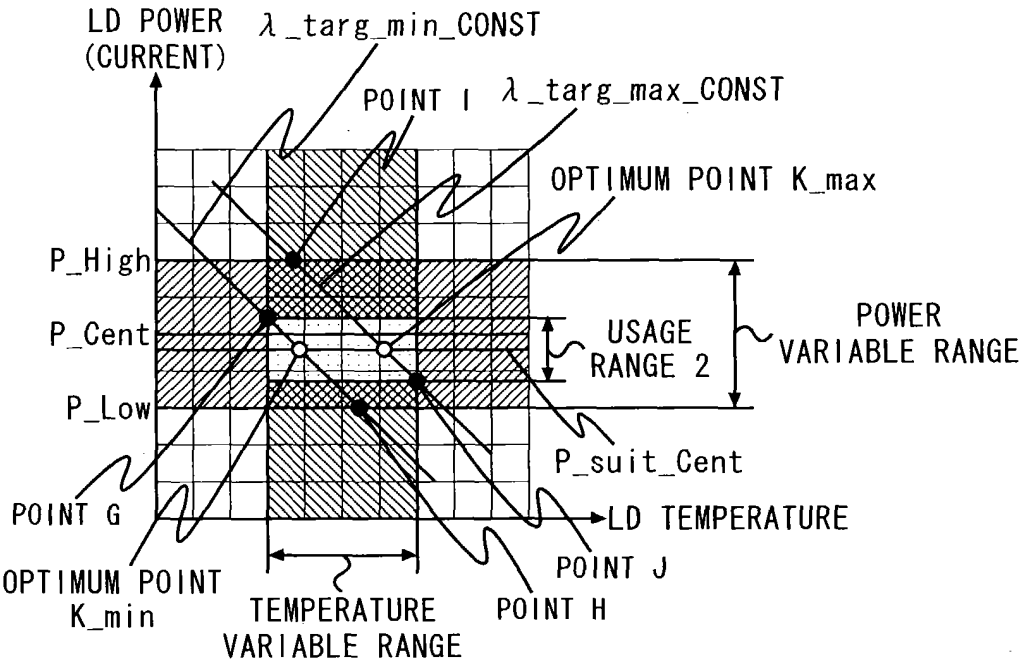

LD POWER
(CURRENT)
λ_targ_min_CONST
POINT I
λ_targ_max_CONST
OPTIMUM POINT K_max
P_High
P_Cent
P_Low
USAGE
RANGE 2
POWER
VARIABLE RANGE
P_suit_Cent
POINT G
LD TEMPERATURE
POINT J
OPTIMUM POINT
K_min
TEMPERATURE
VARIABLE RANGE
POINT H

FIG.18

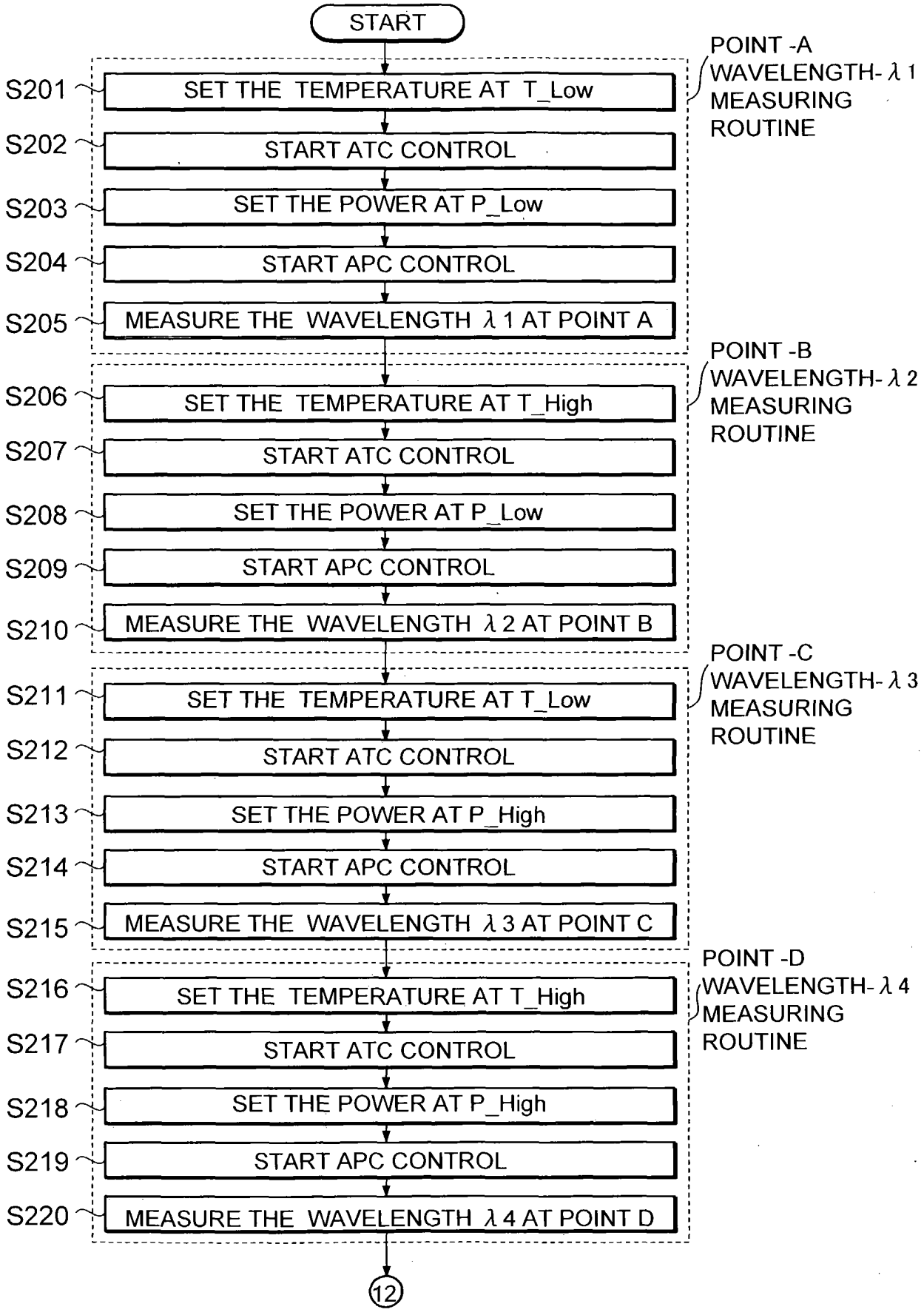

START
S201
SET THE TEMPERATURE AT T_Low
S202
START ATC CONTROL
S203
SET THE POWER AT P_Low
S204
START APC CONTROL
S205
MEASURE THE WAVELENGTH λ1 AT POINT A
POINT -A
WAVELENGTH-λ1
MEASURING
ROUTINE
S206
SET THE TEMPERATURE AT T_High
S207
START ATC CONTROL
S208
SET THE POWER AT P_Low
S209
START APC CONTROL
S210
MEASURE THE WAVELENGTH λ2 AT POINT B
POINT -B
WAVELENGTH-λ2
MEASURING
ROUTINE
S211
SET THE TEMPERATURE AT T_Low
S212
START ATC CONTROL
S213
SET THE POWER AT P_High
S214
START APC CONTROL
S215
MEASURE THE WAVELENGTH λ3 AT POINT C
POINT -C
WAVELENGTH-λ3
MEASURING
ROUTINE
S216
SET THE TEMPERATURE AT T_High
S217
START ATC CONTROL
S218
SET THE POWER AT P_High
S219
START APC CONTROL
S220
MEASURE THE WAVELENGTH λ4 AT POINT D
POINT -D
WAVELENGTH-λ4
MEASURING
ROUTINE
12

FIG.19

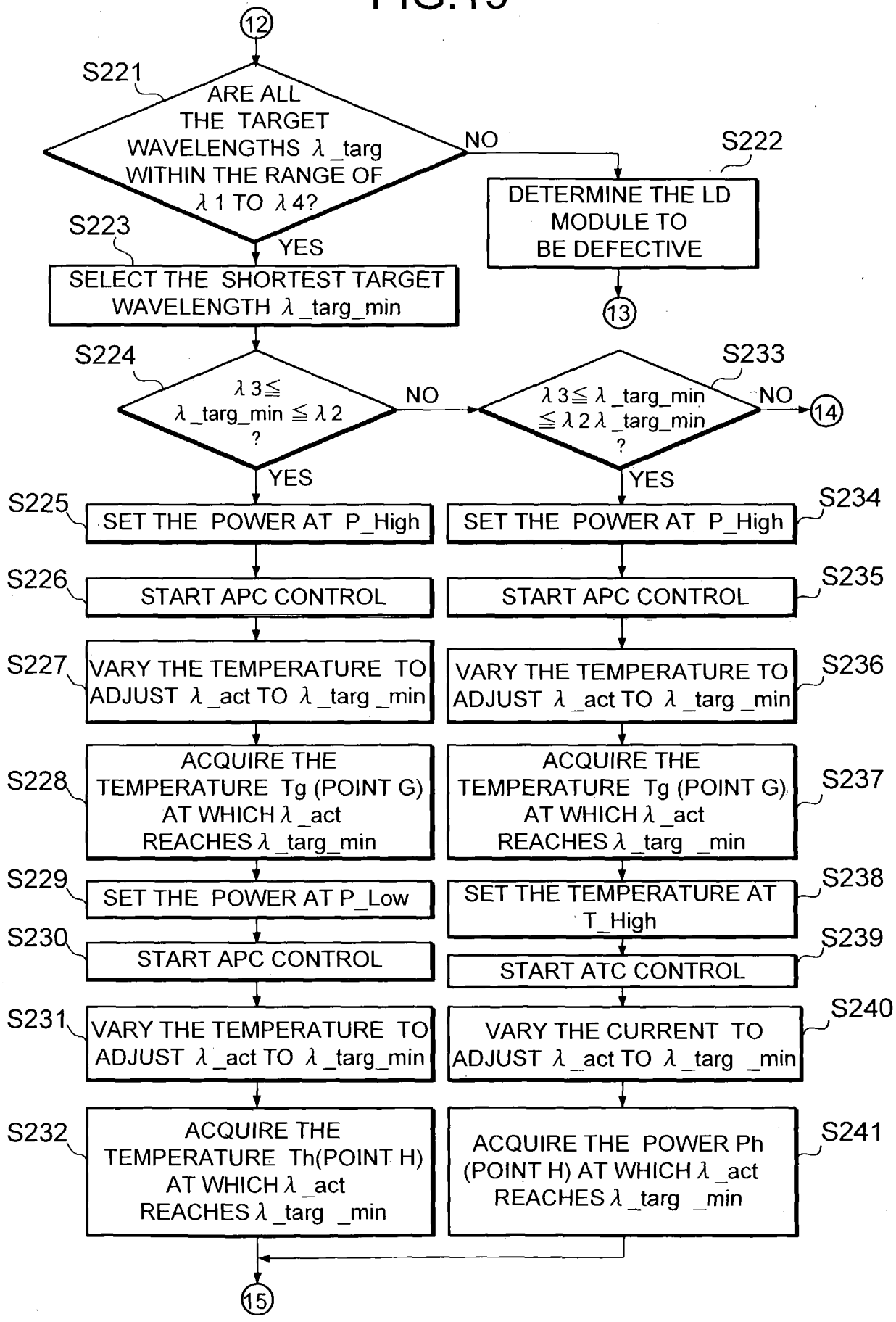

12
S221
ARE ALL THE TARGET WAVELENGTHS λ_targ WITHIN THE RANGE OF λ1 TO λ4?
NO
S222
DETERMINE THE LD MODULE TO BE DEFECTIVE
13
YES
S223
SELECT THE SHORTEST TARGET WAVELENGTH λ_targ_min
S224
λ3≦ λ_targ_min ≦λ2 ?
NO
S233
λ3≦λ_targ_min ≦λ2λ_targ_min ?
NO
14
YES
YES
S225
SET THE POWER AT P_High
S234
SET THE POWER AT P_High
S226
START APC CONTROL
S235
START APC CONTROL
S227
VARY THE TEMPERATURE TO ADJUST λ_act TO λ_targ_min
S236
VARY THE TEMPERATURE TO ADJUST λ_act TO λ_targ_min
S228
ACQUIRE THE TEMPERATURE Tg (POINT G) AT WHICH λ_act REACHES λ_targ_min
S237
ACQUIRE THE TEMPERATURE Tg (POINT G) AT WHICH λ_act REACHES λ_targ_min
S229
SET THE POWER AT P_Low
S238
SET THE TEMPERATURE AT T_High
S230
START APC CONTROL
S239
START ATC CONTROL
S231
VARY THE TEMPERATURE TO ADJUST λ_act TO λ_targ_min
S240
VARY THE CURRENT TO ADJUST λ_act TO λ_targ_min
S232
ACQUIRE THE TEMPERATURE Th(POINT H) AT WHICH λ_act REACHES λ_targ_min
S241
ACQUIRE THE POWER Ph (POINT H) AT WHICH λ_act REACHES λ_targ_min
15

FIG.20

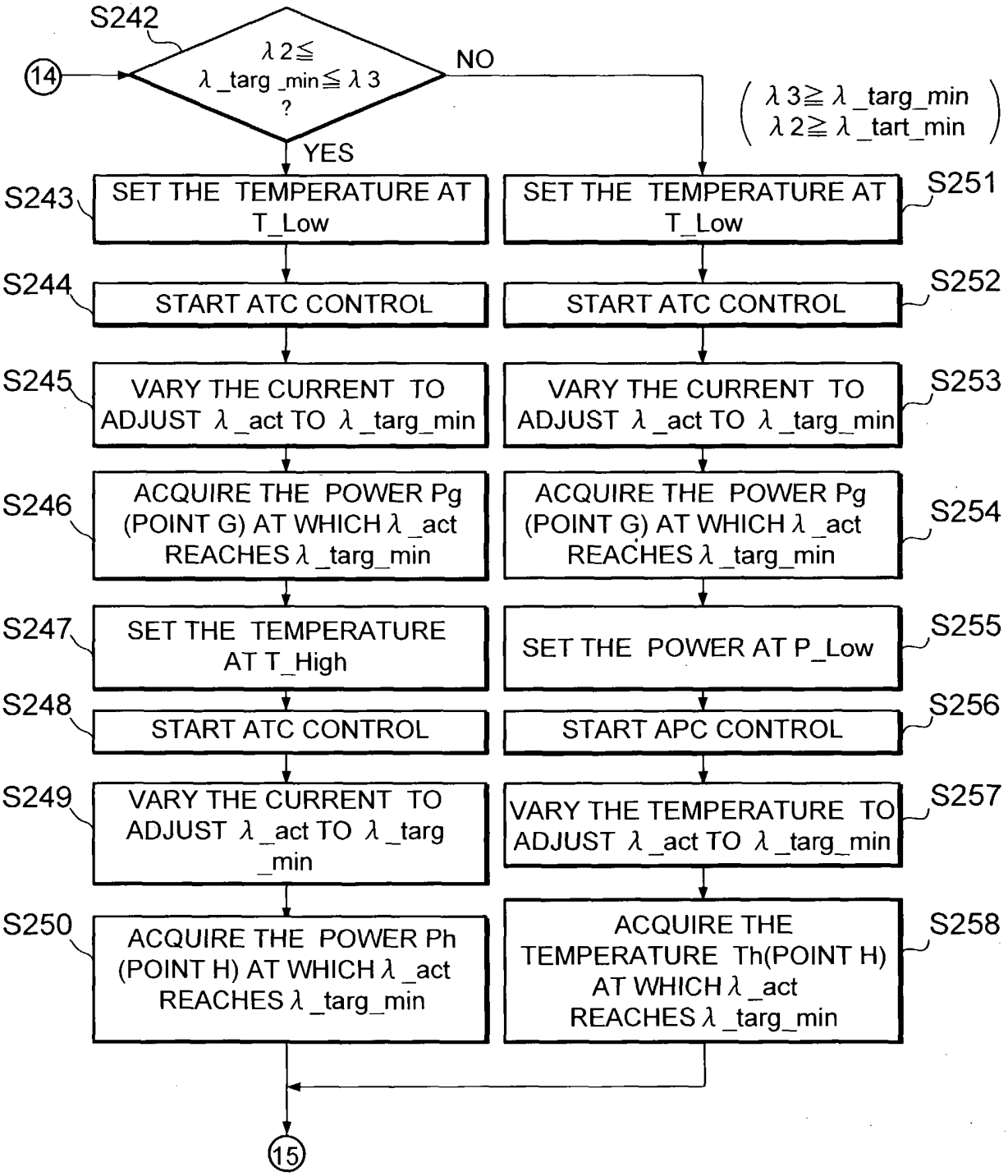

S242
λ2≦ λ_targ_min≦λ3 ?
14
NO
YES
(λ3≧λ_targ_min λ2≧λ_tart_min)
S243
SET THE TEMPERATURE AT T_Low
S244
START ATC CONTROL
S245
VARY THE CURRENT TO ADJUST λ_act TO λ_targ_min
S246
ACQUIRE THE POWER Pg (POINT G) AT WHICH λ_act REACHES λ_targ_min
S247
SET THE TEMPERATURE AT T_High
S248
START ATC CONTROL
S249
VARY THE CURRENT TO ADJUST λ_act TO λ_targ_min
S250
ACQUIRE THE POWER Ph (POINT H) AT WHICH λ_act REACHES λ_targ_min
S251
SET THE TEMPERATURE AT T_Low
S252
START ATC CONTROL
S253
VARY THE CURRENT TO ADJUST λ_act TO λ_targ_min
S254
ACQUIRE THE POWER Pg (POINT G) AT WHICH λ_act REACHES λ_targ_min
S255
SET THE POWER AT P_Low
S256
START APC CONTROL
S257
VARY THE TEMPERATURE TO ADJUST λ_act TO λ_targ_min
S258
ACQUIRE THE TEMPERATURE Th(POINT H) AT WHICH λ_act REACHES λ_targ_min
15

FIG.21

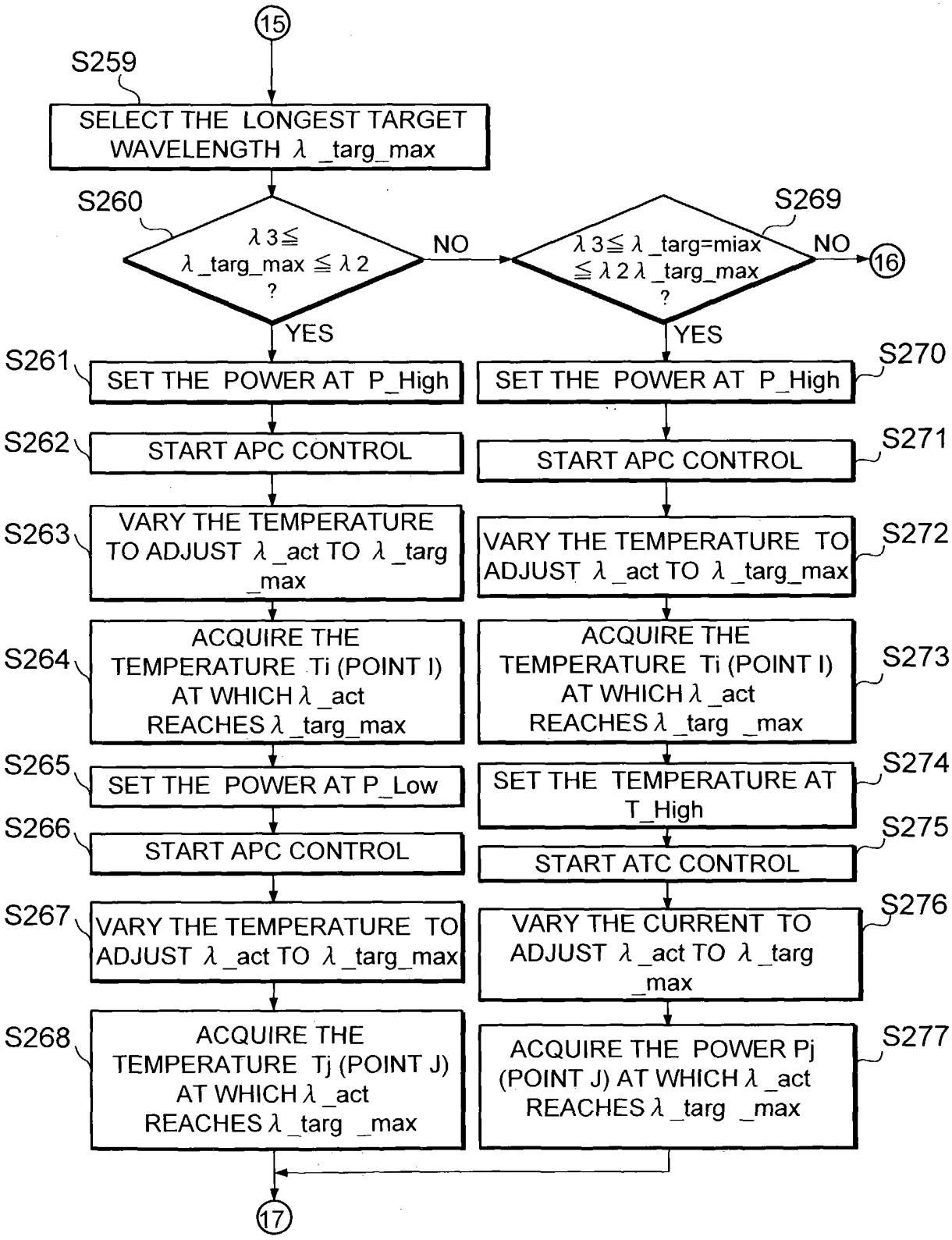

15
S259
SELECT THE LONGEST TARGET WAVELENGTH λ_targ_max
S260
λ3≦ λ_targ_max ≦λ2 ?
NO
S269
λ3≦λ_targ=miax ≦λ2λ_targ_max ?
NO
16
YES
YES
S261
SET THE POWER AT P_High
S270
SET THE POWER AT P_High
S262
START APC CONTROL
S271
START APC CONTROL
S263
VARY THE TEMPERATURE TO ADJUST λ_act TO λ_targ _max
S272
VARY THE TEMPERATURE TO ADJUST λ_act TO λ_targ_max
S264
ACQUIRE THE TEMPERATURE Ti (POINT I) AT WHICH λ_act REACHES λ_targ_max
S273
ACQUIRE THE TEMPERATURE Ti (POINT I) AT WHICH λ_act REACHES λ_targ _max
S265
SET THE POWER AT P_Low
S274
SET THE TEMPERATURE AT T_High
S266
START APC CONTROL
S275
START ATC CONTROL
S267
VARY THE TEMPERATURE TO ADJUST λ_act TO λ_targ_max
S276
VARY THE CURRENT TO ADJUST λ_act TO λ_targ _max
S268
ACQUIRE THE TEMPERATURE Tj (POINT J) AT WHICH λ_act REACHES λ_targ _max
S277
ACQUIRE THE POWER Pj (POINT J) AT WHICH λ_act REACHES λ_targ _max
17

FIG.22

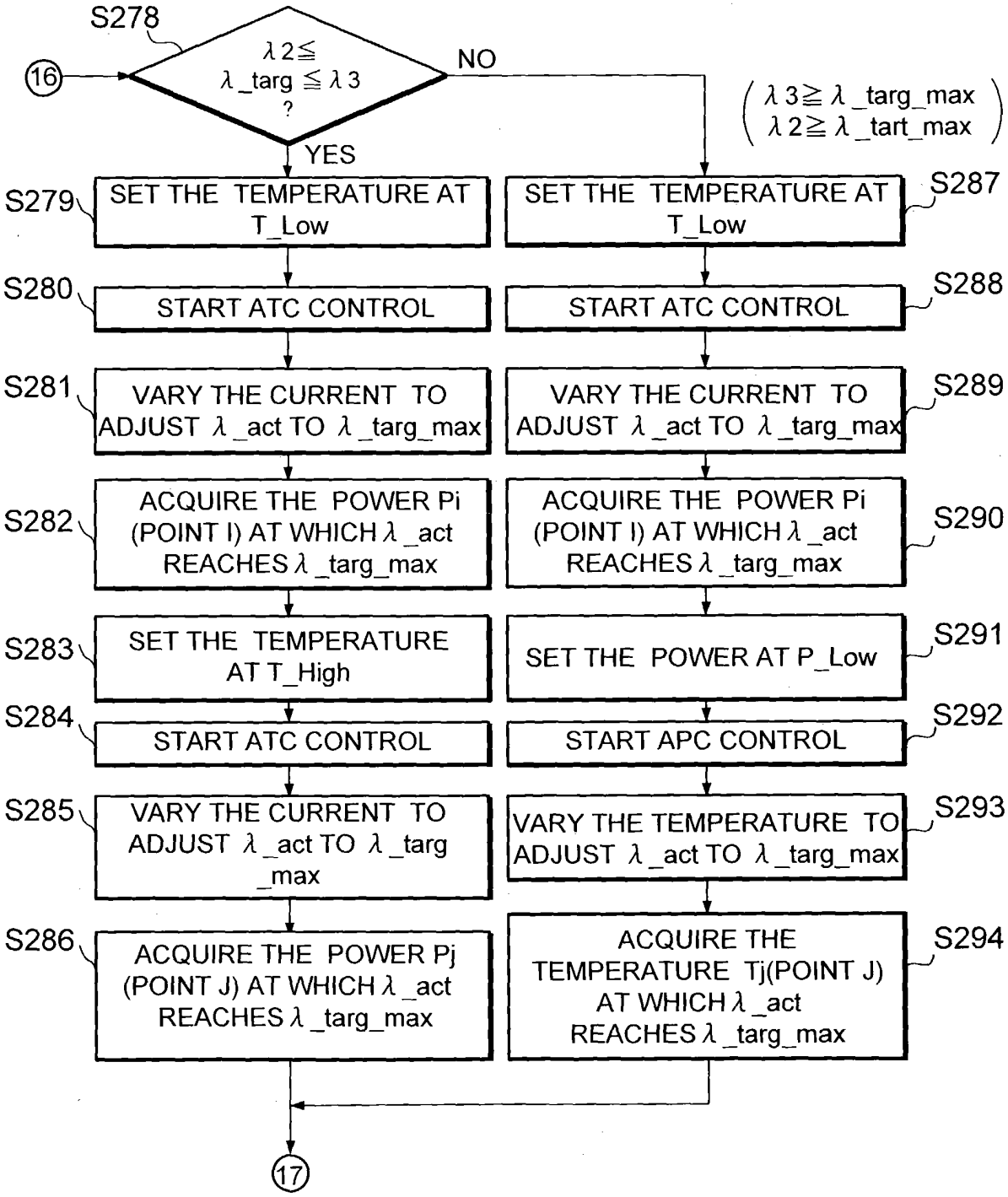

S278
λ2≦ λ_targ ≦λ3 ?
NO
YES
16
(λ3≧λ_targ_max λ2≧λ_tart_max)
S279
SET THE TEMPERATURE AT T_Low
S280
START ATC CONTROL
S281
VARY THE CURRENT TO ADJUST λ_act TO λ_targ_max
S282
ACQUIRE THE POWER Pi (POINT I) AT WHICH λ_act REACHES λ_targ_max
S283
SET THE TEMPERATURE AT T_High
S284
START ATC CONTROL
S285
VARY THE CURRENT TO ADJUST λ_act TO λ_targ_max
S286
ACQUIRE THE POWER Pj (POINT J) AT WHICH λ_act REACHES λ_targ_max
S287
SET THE TEMPERATURE AT T_Low
S288
START ATC CONTROL
S289
VARY THE CURRENT TO ADJUST λ_act TO λ_targ_max
S290
ACQUIRE THE POWER Pi (POINT I) AT WHICH λ_act REACHES λ_targ_max
S291
SET THE POWER AT P_Low
S292
START APC CONTROL
S293
VARY THE TEMPERATURE TO ADJUST λ_act TO λ_targ_max
S294
ACQUIRE THE TEMPERATURE Tj(POINT J) AT WHICH λ_act REACHES λ_targ_max
17

FIG.23

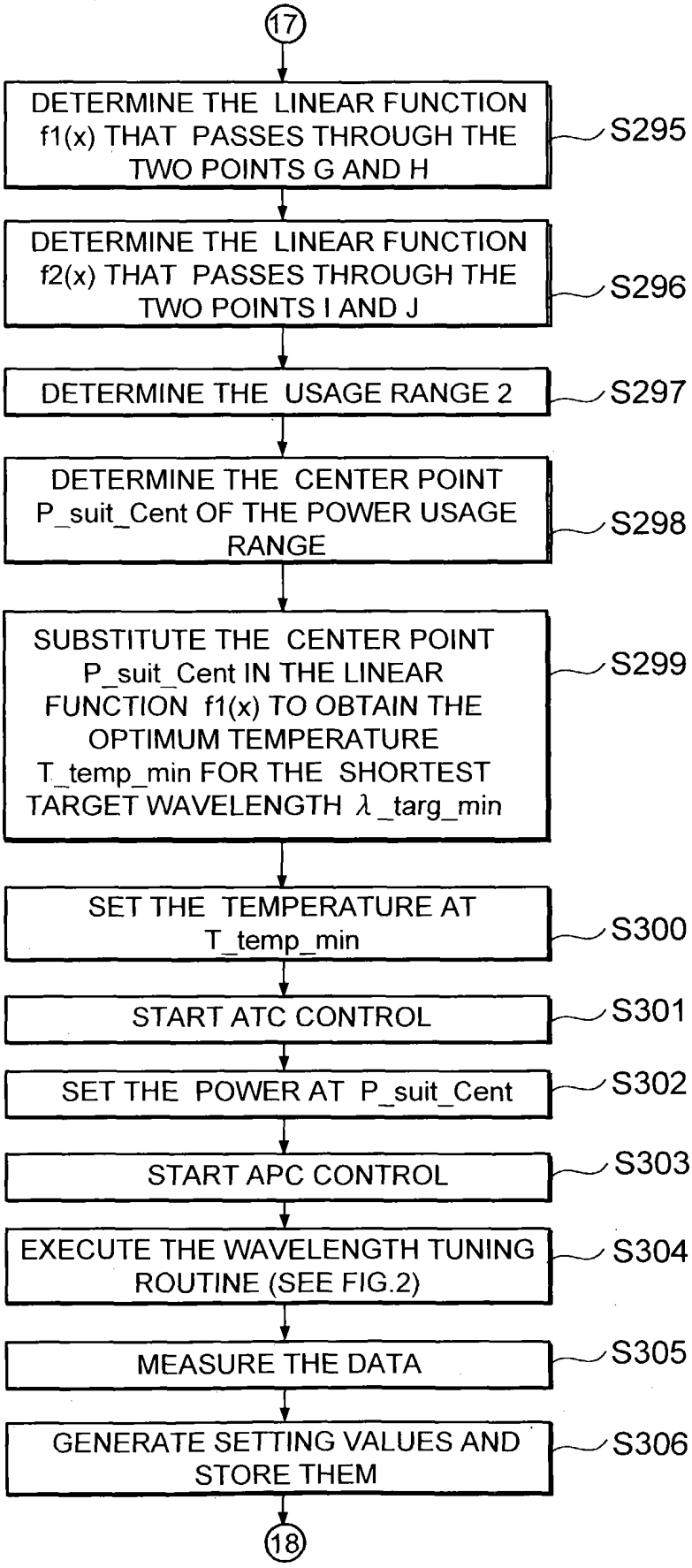
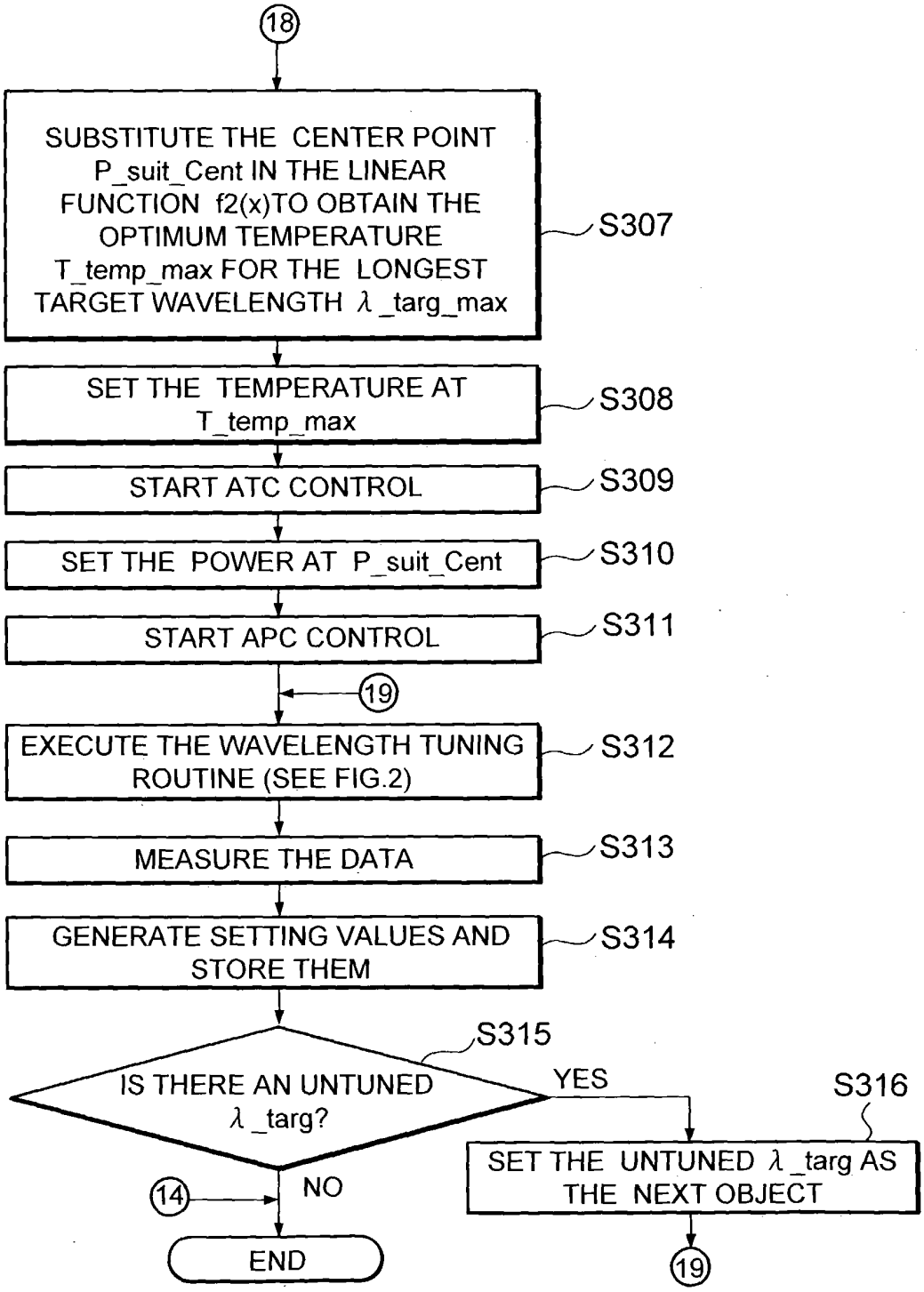

17
DETERMINE THE LINEAR FUNCTION f1(x) THAT PASSES THROUGH THE TWO POINTS G AND H
S295
DETERMINE THE LINEAR FUNCTION f2(x) THAT PASSES THROUGH THE TWO POINTS I AND J
S296
DETERMINE THE USAGE RANGE 2
S297
DETERMINE THE CENTER POINT P_suit_Cent OF THE POWER USAGE RANGE
S298
SUBSTITUTE THE CENTER POINT P_suit_Cent IN THE LINEAR FUNCTION f1(x) TO OBTAIN THE OPTIMUM TEMPERATURE T_temp_min FOR THE SHORTEST TARGET WAVELENGTH λ_targ_min
S299
SET THE TEMPERATURE AT T_temp_min
S300
START ATC CONTROL
S301
SET THE POWER AT P_suit_Cent
S302
START APC CONTROL
S303
EXECUTE THE WAVELENGTH TUNING ROUTINE (SEE FIG.2)
S304
MEASURE THE DATA
S305
GENERATE SETTING VALUES AND STORE THEM
S306
18

FIG.24


18
SUBSTITUTE THE CENTER POINT P_suit_Cent IN THE LINEAR FUNCTION f2(x)TO OBTAIN THE OPTIMUM TEMPERATURE T_temp_max FOR THE LONGEST TARGET WAVELENGTH λ_targ_max
S307
SET THE TEMPERATURE AT T_temp_max
S308
START ATC CONTROL
S309
SET THE POWER AT P_suit_Cent
S310
START APC CONTROL
S311
19
EXECUTE THE WAVELENGTH TUNING ROUTINE (SEE FIG.2)
S312
MEASURE THE DATA
S313
GENERATE SETTING VALUES AND STORE THEM
S314
S315
IS THERE AN UNTUNED λ_targ?
YES
S316
SET THE UNTUNED λ_targ AS THE NEXT OBJECT
19
NO
14
END